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ABSTRACT

This document from the Center for Naval Analysis (CNA) discusses the role of community colleges in Navy training. CNA conducted a study to discover whether outsourcing courses such as air conditioning and refrigeration and information systems administration to community colleges was feasible and cost effective. Analyses focused on two community colleges in the Norfolk, Virginia area, as well as two vocational/technical institutes. The study addressed the following four questions: (1) Is it possible, or necessary, to move Navy training equipment to a community college site? (2) How transferable is the subject matter? (3) How flexible are colleges in terms of Navy involvement in the training? For instance, would the college permit military instructors in addition to college faculty? (4) What is the cost-effectiveness of outsourcing the training? Findings of the study include: (1) Community colleges can provide training similar to that of the Navy but at a lower cost; and (2) Outsourcing training might also be beneficial to Navy recruitment efforts. Considering all the costs and benefits of outsourcing Navy training to community colleges, CNA recommends outsourcing the two courses considered in this study, as well as other types of Navy training, particularly those with the greatest civilian overlap. (CB)

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A Role for Community Colleges in Navy Training

Peggy A. Golfin • John D. White
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Summary

Background

Since the post Cold War downsizing, the Navy has faced the dual challenge of reducing the cost of doing business while remaining the world's most modern and technically capable fleet. Among the management techniques the Department of Defense uses to reduce costs and to improve efficiency is outsourcing.

In recent years, the Navy has outsourced enlisted training by hiring contractors to teach Navy curricula on Navy facilities. In this project, however, we consider a relatively rare form of outsourcing. Previous CNA studies indicated that the community college market could provide the Navy with the opportunity to save significant training costs by recruiting pretrained graduates, which is one method of outsourcing training. These studies described the growing role that community colleges are playing in providing training that is tailored to the communities they serve, and they suggested that community colleges may provide another opportunity for outsourcing enlisted training. As a consequence, CNET tasked us to explore the feasibility of outsourcing courses for active duty sailors to community colleges using their facilities and perhaps even significant parts of their curricula.

Approach

In this project, we investigated the potential for outsourcing three courses in the Norfolk, VA, area. We focused our analyses on two community colleges (Tidewater Community College and Thomas Nelson Community College) and two other types of training institutions for comparison purposes. These latter two included a Vocational-Technical institution (Advanced Technical Institute) and the Norfolk Naval Shipyard.

We investigated the following three courses:

- C-school: NEC 4291 - Air Conditioning and Refrigeration
- C-school: NEC 2735 - Information Systems Administrator
- A-school: Advanced Electronics/Computer Field (AECF) Technical Core Fundamentals.

These three examples provide a variety of challenges that should help the Navy better understand a number of issues related to community college outsourcing, such as accommodating Navy equipment and curriculum and maintaining military training and orientation in a civilian environment.

Our analyses addressed the following questions:

- Is it possible, or even necessary, to move Navy training equipment to a community college site?
- How transferrable is the subject matter? In other words, is the subject matter so Navy-specific that it would be difficult for a community college to provide instruction?
- How flexible are colleges in terms of Navy involvement in the training? For instance, would the college permit military instructors in addition to college faculty?
- What is the cost-effectiveness of outsourcing the training?

Findings

Our analysis shows that community colleges have distinct advantages that enable them to provide training that is similar to that of the Navy but at lower cost. For instance:

- Community colleges can spread fixed costs of training over a larger population, thereby reducing the average cost of training. This is more significant for expensive Navy courses that have a very small throughput.
- State governments subsidize the cost of community college tuition.

- Community college partnerships with industry further subsidize their cost of training.
- Staff turnover at community colleges is low, and the college does not bear the cost to train instructors.
- Competition for enrollments creates incentives for community colleges not only to be efficient but also to keep current with changing technology requirements.

Outsourcing enlisted training to community colleges could also benefit the Navy in its recruiting efforts. For instance:

- Our analysis shows that community colleges often award more college credits for an equivalent course than the Servicemembers Opportunity Colleges–Navy recommends for Navy courses. The possibility of receiving a significant amount of college credit while on active duty, at no cost and during regular hours, could help recruiting.
- The presence of active duty sailors on campus and attending class in uniform could increase Navy awareness and thereby advance the efforts of Navy recruiters in breaking into this market.

Outsourcing training to community colleges raises concerns that have inherent costs. Some of these concerns follow:

- Instructor billets provide high-quality shore tours for fleet sailors; recent evidence shows that instructor tours have a positive impact on retention and promotion.
- Military instructors provide recent fleet experience.
- Civilian instructors may not be able to provide necessary military acculturation.

Our findings indicate significant overlap with *current* community college curricula in all three courses. Also, the colleges were willing and eager to modify current programs to accommodate the Navy's training requirements, including, if necessary, Navy instructors. Only the Navy-specific equipment used in the Air Conditioning and Refrigeration C-school presented a problem for Thomas Nelson Community

College. Tidewater Community College stated that it had the physical facilities to accommodate the equipment.

On average, the estimated cost for community college training (which is a tuition charge only) is one-sixth of the Navy's cost to train (not including student pay and allowances). This is not the total savings, which would require factoring in other costs and benefits. For instance, if the Navy uses fewer instructors in the community college training, the cost of a reduction in retention and productivity that these types of billets generate would need to be weighed against the savings in outsourcing the billets. And a reduction in the cost of awaiting instruction because of backlogs in the AECF Technical Core Fundamentals, estimated to be close to $3 million in FY 97, would also have to be included.

Considering all the costs and benefits, we believe there is significant potential for saving the cost of training in outsourcing these three courses to a community college. Our analysis indicates that savings could also result from outsourcing other types of Navy training, particularly those with the greatest civilian overlap in terms of both equipment and subject matter.

CNET concurs with our recommendations for outsourcing the two C-school courses included in this study, and it is pursuing this option. However, it does not support the outsourcing of A-school instruction. CNET believes that the loss of militarization that could result from junior sailors attending civilian institutions with some or all civilian instructors is a cost that outweighs the benefits. According to CNET, remedial measures cannot adequately minimize this loss of militarization at present.

Introduction

Background

As technology changes ever more rapidly, the need for a more technically trained Navy and the costs of such training increase rapidly. In a series of studies, CNA has demonstrated that outsourcing has the potential to generate significant savings [1, 2, 3].

Outsourcing offers several ways to save Navy training costs. In recent years, the Navy has outsourced some instructor billets in Navy-run schools. An alternative approach, however, is to outsource the entire school in one of two ways:

- Recruit people who have received training, at their own expense, that is comparable to Navy training, saving all or some of the cost (recruiting pretrained).
- Contract for training by sending Navy students to community colleges.

We have explored recruiting pretrained elsewhere and will only briefly review the arguments. The real focus of this research memorandum is on contracting training directly to community colleges.

Recruiting pretrained

The Navy's traditional enlisted recruiting model is to access unskilled high school graduates and train them within Navy-operated formal schools for technical education. Thus, the Navy not only uses technical skills in carrying out its mission, but is also heavily engaged in producing the manpower that provides these skilled services. As part of its general recruiting, the Navy has brought in small numbers of community college graduates or even four-year college graduates, but these recruits were not part of any systematic effort to tap this part of the recruiting market.

Since FY 1996, CNA has been part of the Navy's efforts to increase recruitment from community colleges in general, and to focus on some targeted majors for recruiting pretrained [4, 5]. The community college market offers three main advantages. First, it is a large and virtually untapped market. None of the services bring in much more than 1 percent of their recruits from the community college market, and yet it could represent as much as one-third of the population not attending four-year colleges. Second, in a number of areas, a community college education is the same or nearly the same as Navy training. By recruiting from the pretrained population, the Navy could avoid large amounts of training costs. Third, those community college graduates who have been recruited in the past have done well on traditional performance metrics, such as lower attrition. In addition, these graduates may be more broadly trained (e.g., in reading and writing skills), which may further enhance Navy performance. Because they spend less time in Navy schools, they may also spend more time in fleet assignments.

The fact that the community college market is relatively new raises some concerns. The main question is the predictability of the quantity and quality of the flow. How competitive will the military services be in this market? This unpredictability may complicate the training planning process. But, these concerns may well be transitory. As the Navy gains experience, it may also get better at reducing or planning through the uncertainties.

Why use community colleges?

In our initial work in this area, CNA focused on using community colleges to expand the recruiting market. In this work, we have shifted focus to using community college facilities and resources as a substitute for Navy infrastructure.

Advantages

When the Navy provides all or most of its training with its own personnel on its own facilities, it faces some constraints or inefficiencies that it would not face by shifting the training to civilian institutions. This section details some of the advantages that community colleges might have in overcoming these inefficiencies.

Overhead spread to civilian and military students

In some skill areas, the Navy's training requirement is not very large, yet in-house training requires an infrastructure. When fixed costs abound, such as expensive practice equipment or simulators, only a small number of people share the cost of this infrastructure. A primary efficiency that a community college could provide to the Navy is the ability to spread these fixed costs over a larger population of students, thereby reducing the average costs of training. Conversely, community colleges could benefit from the same type of cost sharing.

Subsidies from states

State governments subsidize community college costs and then regulate the level of tuition the schools may charge. Although the costs vary from school to school, the average Virginia costs are between about $48 and $54 per credit [6, 7]; given the competitive environment and statewide oversight, they are unlikely to change greatly in the near future. These subsidies and credit cost limits apply to military students as well as civilians. Thus, by sending Navy students to community

colleges, the Navy in effect would be receiving training subsidies. When the Navy provides in-house training, it must pay the full cost of training, which in nearly all circumstances is likely to be higher. The potential savings to the Navy is substantial.

Some have argued that these subsidies will not survive once the state government becomes aware that the state is subsidizing the Navy. Many community colleges, however, have arrangements to provide training with private for-profit companies at the same state subsidized tuition rates that resident students pay.

Subsidies from industry

Community colleges have the potential to provide another form of indirect subsidies for the Navy. Community colleges in many locations have aggressively pursued new technology and partnerships with industry. States have collaborated with them in these efforts because industrial partnerships with community colleges further subsidize institutional costs.

CNA found many instances of companies, such as Lucent Technology, IBM, and Microsoft, providing community college classrooms with the latest computer software and hardware at greatly reduced cost or no cost. Tidewater was negotiating with the Carrier Corporation for donation of large air-conditioning equipment for training use. Industry often gets incentive tax breaks from state and local governments for its involvement, and students have access to cutting edge skills training and familiarity with certain industry equipment and products that they will probably use in the future.

The Navy does not permit these types of joint ventures and donations for its training. Therefore, to the extent that community colleges receive industry subsidies through these partnership arrangements or donations, it provides additional implicit subsidies for the Navy that would not otherwise be available.

All the fiscal and capital investment issues above add stability and permanence that may not be present in private or Vocational-Technical (Vo-Tech) training facilities.

Faculty/staff qualification

Military instructors have both advantages and disadvantages in providing Navy training. The main advantage is that they provide fleet credibility to the training. The disadvantage is that they are often inexperienced teachers who must go through a learning process to hone their teaching skills. Then, just as they are mastering their teaching techniques, they have to rotate back to the fleet.

A State Board or Council of Higher Education (or some similar body) usually approves a community college. Virginia community colleges also must meet the requirements of the State Board for Community Colleges and the approval for membership in the Virginia Community College System. They are accredited by a recognized commission—in the case of the Virginia community colleges we visited, the Commission on Colleges of the Southern Association of Colleges.

Faculty members must meet state credentialing requirements. They usually are experts in their fields and specialize in training. Because faculty affiliations with community colleges tend to be strong, staff turnover is low. Many community colleges, in conjunction with industry, have created joint programs to enable instructors to stay current in their fields. Companies can enroll community college faculty in training programs through short-term, industry-based work assignments. Incentives are available to enable and encourage instructors to participate. For example, at Tidewater, most Information Systems Administrator (ISA) curriculum faculty are Novell- or Microsoft-certified Network Administrators and hold the minimum of an Associate degree in a technical specialty.

Community colleges are able to hire on a part-time and adjunct basis and often are able to procure the services of members of leading-edge industries.

Community colleges are competitive

Community colleges are competitive with each other and with private Vo-Tech institutions. They are constantly evaluated against specific standards and performance benchmarks to measure their effectiveness. Both private and public 2-year degree programs must provide

educational qualifications that meet the expectations and needs of employers and employees.

Community colleges in the last 5 years have lowered their staff turnover and increased student completion/graduation rates, made infrastructure improvements with newer buildings and modern labs/equipment, integrated modern business/management practices, and incorporated new efficiencies into their administration.[1]

College credit

Community colleges award more credits for equivalent courses than the Navy does. For instance, Tidewater Community College has indicated that it would award 18 credits for an Air Conditioning and Refrigeration (AC&R) course comparable to that for NEC 4291, CIN A-720-0010 [8]. The recommendation of the Servicemembers Opportunity Colleges—Navy (SOCNAV) for the Navy AC&R course is 5 credits [9]. Community colleges have a wide web of association, making credit transfer fairly uniform and complete. The Navy student has a great deal of flexibility in building on Navy outsourcing and continuing toward an Associate degree.

Increase civilian awareness of the Navy

As the Navy gets smaller and more experienced, the amount of contact between Navy personnel and civilians will likely diminish. This trend is unfortunate because it may undermine long term support. Holding Navy classes—attended by sailors in uniform—on campus would increase overall awareness and general interest in the Navy. Another benefit of this contact is that it could enhance the recruiting environment for community college graduates.

Concerns with outsourcing

Although outsourcing training to community colleges has many benefits, there are also several valid concerns. Instructor billets provide high-quality shore tours for fleet sailors. The quality of these shore

1. Commission on Colleges of the Southern Association of Colleges.

tours may be important for both retention and future fleet readiness. Shore rotation requirements to maintain retention rates mean that the Navy may have more personnel assigned ashore than are necessary for tasks assigned. If personnel in the training infrastructure would end up in make-work jobs when their training billets were eliminated, the Navy saves nothing by eliminating those billets. In fact, there are probably valuable alternative uses for those personnel. However, if their contribution elsewhere is less than it was in the training billet, the savings from competing training billets may be overstated.

Furthermore, sometimes the best way to learn a subject is to teach it. Thus, petty officers in instructor billets may gain something from that experience that may make them more productive and better supervisors when they return to the fleet. A recent CNA study [10] suggests that these tours have a positive effect on both promotion and retention. A reduction in the number of instructor billets could lessen this important feedback to the fleet. One possible way to offset some of this effect would be to contract with the community colleges to use some military instructors to teach classes in conjunction with the civilian faculty.

Training courses, particularly initial skills training for new recruits, have another goal besides learning the requisite skill. Students are expected to assimilate into and adapt to the military lifestyle. College campuses do not provide the opportunity for learning about military life. Actually, they are more likely to undermine lessons about military life. Therefore, classes on community college campuses will reduce student exposure to the military environment.[2]

2. Whether the Navy could overcome this with countermeasures is beyond the scope of this study.

Alternative models for outsourcing

In this section, we discuss two methods for saving the cost of training: (1) contracting a community college to provide civilian instructors to teach in Navy schools and (2) outsourcing to a civilian facility to provide training using either civilian or Navy instructors or both.

Navy facilities with civilian instructors

Use of civilian instructors on Navy facilities has been fairly widespread for a number of years. For instance, civilian instructors from San Diego Community College District currently teach several courses on Navy facilities (e.g., NEC 4291, Air Conditioning and Refrigeration, at Fleet Training Center San Diego; and the AECF technical core fundamentals at Service School Command Great Lakes).

This method of outsourcing training has the potential for saving the Navy money in a limited number of ways. Depending on the contract, the community college may be able to provide instructor services at a lower cost because it can hire part-time and temporary staff to accommodate the uneven flow of sailors through the training pipeline. The cost of college instructors must be compared to the total compensation of a Navy instructor. Currently, the programming rate is about $35,000 per sailor (this cost includes benefits as well as pay). And, since the college provides all the instructors, the Navy also saves on the cost of training sailors to become instructors. However, if the length of the curriculum and the methods, facilities, and equipment used to teach the course are identical to those used when Navy instructors teach, the savings will tend to be very small.

Civilian facilities

The other method outlined for outsourcing training is using civilian facilities with Navy or civilian equipment and/or instructors. The

Navy has very little experience with this type of outsourcing, but, depending on the extent to which civilian instructors and equipment are used, this method has the potential for very large savings.

What are the benefits and concerns of this option? They depend on the type of instructors and who owns the equipment.

Navy instructors only

In some cases, community colleges may be willing to use military instructors to teach on their campuses. Navy instructors provide more military atmosphere and military training background than civilian instructors. As a result, military instructors might enhance Navy core values and reduce concerns about militarization of young sailors. Also, if the billet is in a Fleet Concentration Area (FCA), this billet would continue to support homebasing efforts. This option saves the least in training costs because the Navy instructors are full-time, full-year workers regardless of workload.

Civilian instructors only

Civilian instructors have the opposite strengths and weaknesses from the military ones. Civilian instructors will typically have more podium experience (Navy instructors rotate after only a few years at the podium) but less military experience. In some cases, the instructors will be retired military, in which case they may have an equal amount of or more military experience but probably lack recent fleet experience. Civilian instructors can cost less than military because they can be hired for the services needed rather than for full-time, full-year work. Also, eliminating military billets has a deleterious effect on sea/shore rotation and perhaps on homebasing, in addition to causing a loss in productivity-enhancing shore duty cited previously.

Combination of both civilian and Navy instructors

This method has a combination of the benefits and concerns of the other two options; however, some have raised concerns about contractual complications of this case. The argument is that, unless there is a clear delineation of duties by subject matter, it may be difficult to evaluate the teaching effectiveness of the different instructors. In

other words, if both civilians and Navy instructors are teaching the same material, and sailors are generally failing that subject, it could be more difficult to determine which approach is not effective (or whether both are not effective). Assigning unique subject matter to each instructor could alleviate this problem. For instance, to minimize costs by using the least number of Navy personnel, Navy instructors could teach only Navy-specific material.

The right mix of civilian and Navy instructors depends on a variety of factors, including the desirability of retaining instructor billets and the ability of the college to teach the particular curriculum if it is Navy-specific. This is less of a problem if the outsourcing is done in FCAs because they usually have a large pool of retired Navy personnel. In fact, it is not unusual to find retired Navy personnel on the faculty of most community colleges in FCAs.

Navy versus civilian equipment

If the equipment is not Navy-specific and the college owns the equipment, the college bears the cost of purchasing and maintaining the equipment, saving the Navy additional training costs. The college helps to recover the cost of the equipment by using it in non-Navy classes.

If the equipment is Navy-specific, the Navy might want to consider making the college responsible for maintenance costs. And, DOD requires that Navy equipment that is on civilian facilities must be inspected periodically for proper servicing, use, and so on.

Options we have explored

As part of our tasking, CNET asked CNA to identify several specific options that could serve as experiments for the concepts described in this paper. In this section, we provide detailed information on three such options:

- A "difficult" C-school: NEC 4291 - Air Conditioning and Refrigeration (AC&R)
- A "medium" C-school: NEC 2735 - Information Systems Administrator
- A "mixed" A-school: Advanced Electronics/Computer Field Technical Core Fundamentals.

These courses would be relatively difficult or easy to outsource for a variety of reasons, such as type of equipment necessary, overlap with civilian training, and issues involved with loss of militarization.

CNA investigated the feasibility of outsourcing each of these courses in the Norfolk, VA, area. We chose this area because it is one of the two sites where students can take NEC 4291 (the other is FTC San Diego), and the building in which it is taught in Norfolk FTC has been condemned. Consequently, this is an opportune time to determine the feasibility of outsourcing this training to a civilian facility.

All the community colleges and Vo-Tech centers that CNA visited in the Norfolk area were eager to demonstrate the capability to satisfy Navy needs and expressed an ability to be flexible in implementing specific Navy requirements. All also expressed willingness to allow Navy instructors to co-teach with their faculty.[3]

3. Discussions held 4–5 June 1997 with TCC, TNCC, and ATI Staffs and 16 June 1997 with TCC Staff and NNSY Superintendent of Training.

Outsourcing of these schools to any of the Norfolk sites we discuss below would require the Navy to provide transportation and the cost of lunch for Navy students, estimated to be about $3 per day per person.

Where did we look?

Tidewater Community College (TCC)

TCC has four campuses: Portsmouth, Virginia Beach, Chesapeake, and Norfolk (the latter under development/expansion downtown). We visited Portsmouth and Virginia Beach because they are the principal AC&R and Information Systems Administrator instruction sites and have existing adequate classroom space and area available for lab expansion.

TCC has been in existence since 1968 and has almost 27,000 students currently enrolled. The faculty has 268 full-time and 709 adjunct instructors. Most students are in evening classes, which means many facilities and faculty are idle during the day. TCC offers 84 courses of study leading to an Associate degree, or credit toward one, including AC&R, Electronics, and Computer Information Systems.

TCC aggressively pursues local community linkages and has 46 partnerships with industries and military bases, including Sumitomo Corporation, Virginia Power, Ford Motor Company, McDonalds, Newport News Shipbuilding, Coast Guard, Naval Air Station Norfolk, and Army Transportation Center Safety Office. The Navy hosts off-campus TCC classes on four bases (Naval Base, NAS Norfolk, NAS Oceana, NAB Little Creek).

These partnerships facilitate flexible treatment of courses and students to work around limitations that may be part of the employer's environment—in the case of the Navy, underway periods.

Thomas Nelson Community College (TNCC)

TNCC, established in 1968, is in Hampton, VA, about a 30-minute drive from the main naval base. The student enrollment is over 6,000 students with 128 permanent and 287 part-time faculty. The college

promotes strong links to the surrounding community, particularly nearby Langley Air Force Base.

Advanced Technical Institute (ATI)

ATI is a small, technical school that provides classes in small diesel engine maintenance, automotive and heavy vehicle tractor-trailer driving, as well as heating, ventilating and air conditioning (HVAC). It was founded in 1993, has conducted training in HVAC since March 1994, and in 1996 initiated curriculum changes to conform to the National Skill Standards.

The current student body numbers approximately 205, a significant portion of whom are in retraining programs as a result of recent Department of Defense downsizing. About 60 of these are in the HVAC program.

Norfolk Naval Shipyard (NNSY)

The NNSY has large, underused areas and classrooms available for training purposes. The shipyard is aggressively advertising its training facilities and capabilities and is seeking training contract opportunities. While training is admittedly not the primary function of the shipyard, NNSY cites the fact that the "overhead is paid for" and makes it competitive with schools whose sole function is training.

Unlike the other sites visited, which stated the cost on a per-student basis, NNSY costs are on a per-instructor man-day basis. One student or 20 students in the classroom would be the same cost. The shipyard tries to maintain an instructor/student ratio of about 1:8 in the laboratory environment [11]. The instructor man-day charges currently are $288. The rate is expected to be $350 next fiscal year [11]. Budget considerations determine the rate.

Other facilities

Other facilities in the Norfolk area may be capable of providing some training to the Navy. CNA investigation, however, has concentrated primarily on community colleges for the reasons and benefits stated previously. Most facilities other than community colleges are simply

too expensive and do not appear to offer anything close to comparable savings. In addition, community college growth over the years and continued state support indicate stability that some private facilities cannot match. CNA looked at a few such facilities and included them in this paper for comparison purposes.

Air Conditioning and Refrigeration (AC&R)

Background

AC&R is a Navy C-school taught on the naval stations in the two Fleet Concentration Areas of Norfolk, VA, and San Diego, CA. The students are primarily fleet returnees who are under instruction en route to a new permanent duty station. The FY 1998 requirement for AC&R school graduates is approximately 210 each for Fleet Training Centers (FTCs) Norfolk and San Diego.[4] The curriculum is 10 weeks long, which necessitates at least ten class convenings annually on each coast. Current cost per student is between $6,700 and $9,000, not including pay and allowances.[5] The initial estimates per student at a community college were less than $2,000. It appeared early on that this was a course that could offer significant savings.

Another constraint that could affect outsourcing is berthing. Since students in AC&R are currently berthed in existing on-base BEQ facilities, there are no issues associated with shifting the AC&R school to community colleges in the Norfolk area (see appendix B).

AC&R requires Navy-specific equipment that is quite large, occupying about 15,000 square feet of lab space. Such equipment is not usually found in commercial applications. Outsourcing is considered difficult because the Navy will have to provide this equipment to the training site, and the site must be suitable. However, as explained in a

4. Planning Data Sheet for NEC 4291 C-School Requirements as of October 1996 (Pers-221, CNET-T23311, N-869).

5. A precise cost figure is difficult to pin down. The $6,700 is from NETPDTC FY 97 data, $9,000 is from NETPMSA FY 95 data. A breakdown of cost estimates further than MPN and O&MN totals is not available.

subsequent paragraph, the equipment at FTC Norfolk must be moved to a new location regardless.

Civilian correlation

The Navy course of instruction is similar to that conducted in community colleges and Vo-Tech schools. In particular, the smaller pieces of equipment, such as galley units, are the same, and the maritime setting of most Navy requirements does not affect the theory and principles of air conditioning. The Navy has some large, specialized units not normally seen outside the maritime environment. In addition, AC&R Technician Skill Standards, published in 1996, provide a basis on which to evaluate instruction objectives. The Vocational-Technical Education Consortium of States (V-TECS) developed these standards under the sponsorship of the National Skill Standards Board.

More than 200 community colleges across the nation teach AC&R, including several in the Fleet Concentration Areas (FCAs) of Norfolk, San Diego, and Jacksonville. FTC San Diego already contracts out to San Diego Community College District to teach AC&R in FTC classrooms and labs, with an approved Navy-developed curriculum.

New building requirement

The AC&R school at FTC Norfolk has been condemned, and proposals for construction of a new building are being explored. The Navy estimates that a new building would cost $6 million, $2 million of which would be allocated for AC&R classrooms and labs.[6] If outsourcing to a community college proves feasible, it would be possible to save the construction costs associated with AC&R in addition to the anticipated instruction costs.

Findings at sites

CNA investigated ten schools in the Norfolk vicinity that teach AC&R. Of those, we considered four to have the most potential to accommodate Navy needs: Tidewater Community College, Advanced Technical Institute, Thomas Nelson Community College, and the Norfolk Naval

6. CNET-N5223.

Shipyard. We ruled out the others because they did not have adequate facilities, were high school Vo-Tech centers only, or were in startup development.

Tidewater Community College

TCC has a well-established AC&R program. The facilities have room for expansion, as does the class schedule because most of the current students attend evening classes. All but one of the instructors are prior Navy Chief Petty Officers. The program teaches to the National Skill Standards. After reviewing the Navy curriculum outline, TCC said it could duplicate the Navy course—232 classroom hours, 136 laboratory, and 28 testing, for a total of 396 hours [8]. This would equate to 18 credit hours for each student. In comparison, SOCNAV recommends 5 credits for the Navy course [9].

The main campus is Portsmouth, an ex-Navy ammunition storage facility. TCC converted this huge warehouse into classrooms, cafeteria, meeting rooms, and a 45,000-ft^2 gym, which the college identifies as available space for an expanded AC&R laboratory.

TCC indicated that it could provide similar arrangements to the FTC in San Diego if it could get the Navy-specific equipment. TCC also indicated that, should the Navy give the equipment, TCC would assume all maintenance responsibility. In addition, TCC has established industry links with major manufacturers, such as the Carrier Corporation, to foster information exchange and equipment donations for classroom/laboratory use.

The cost of instruction is $53 per credit [6]. With 18 credits awarded for the 10-week course, the total to train would be $954 per student.

Advanced Technical Institute

ATI has conducted training in HVAC since March 1994, and in 1996 it initiated curriculum changes to conform to the National Skill Standards. About 60 students are in the HVAC program, primarily in evening classes. The staff draws on both civilian and military training experience and includes a former Navy AC&R "C" school instructor. The facilities are large enough to accommodate the Navy-specific equipment, but a study would probably be necessary to ensure that

the foundation is adequate. The staff was most eager to demonstrate the ability to meet Navy needs.

ATI quoted the cost for a 10-week course to be about $1,500 per student.

Thomas Nelson Community College

The TNCC AC&R program is on a much smaller scale than that of Tidewater Community College. However, it teaches to National Skill Standards.

Most classes are evening only and the lab is small, augmented by using the nearby New Horizons Technical Center laboratory. New Horizons is a high school Vo-Tech facility. At present, TNCC cannot accommodate the annual Navy requirement of 207 students in Norfolk FCA.

The TNCC cost is about $55 per credit hour.[7] Ten credits would be awarded, making the total $550 per student.

Norfolk Naval Shipyard

NNSY has no AC&R training equipment in place but has more than adequate space (over 34,000 ft^2) to install all Navy-specific and other equipment. In addition, an unused cooling tower on top of the training building could be readily adapted to support the training equipment. Classrooms and support facilities are excellent; however, instructor staff would probably need to be augmented because training is not a primary shipyard function.

Berthing facilities on base are of adequate quality, but availability depends on the number of ships in the yard for repair. While capacity for E-1 to E-6 bunks is 1,185, priority for available BEQ space is given to ship personnel, and the projected fleet utilization is over 100 percent (see appendix B).

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7. This figure is higher than that in the college catalogue ($48) and was explained to be an estimate based on a combination of tuition and administrative fees since the Navy requirement was for a concentrated, 10-week course.

We estimate the cost per class to be about $23,503,[8] based on the expected instructor man day rate of $350 [11]. This results in a per-student rate of $1,175, assuming every class has 20 students with no attrition.

Proposal

The first proposal is to experiment with outsourcing AC&R training in the Norfolk area. TCC, ATI, and NNSY have all expressed particular interest in conducting the school (but other institutions may be both interested and capable).

The major benefit from this proposal is that it is likely to save the Navy both on the cost of providing the training and the cost of building a new engineering building at FTC Norfolk.

Each institution expressed a willingness to permit military instructors on campus to alleviate concerns about loss of militarization (which tend to be smaller with C schools than with A schools) by establishing a joint instructor plan. As we have mentioned previously, added benefits to outsourcing to a community college are the recruiting effects of an increased Navy presence and awarding of college credit, as well as the greater guarantee of long-term stability compared with other types of institutions. While it is difficult to assign these a monetary benefit, one should consider them when weighing alternatives.

We recommend evaluating the requirement to provide Navy-specific equipment to determine whether to move all or only a portion of it to the outsourcing site.

8. The $350 per day rate is $17,500 for a 10-week course. About 136 hours are in the lab (34.3 percent of 396 total hours). Two instructors are anticipated for lab work, adding $6,003 to the total cost.

Information Systems Administrator—NEC 2735

Background

The CNET Training Vision Executive Steering Committee (ESC) and the Navy Apprentice-Journeyman-Master (A-J-M) Concept consider NEC 2735 to be an advanced-level course. FY 1997 was the first year the 8-week ISA (NEC 2735) course was taught. This new requirement is for the Radioman (RM), Data Processing Technician (DP) (which will merge into the RM rating in October 1997), and some Cryptologic Technician (CT) ratings.

Why we looked at the ISA course

We chose the Information Systems Administrator (ISA) NEC 2735 course as a candidate for outsourcing for several reasons:

- Rapidly changing technology and immediate fleet requirements will probably increase the Navy demand for NEC 2735. The Navy will not be able to meet all fleet and shore ISA billet requirements for several years.
- The community college curriculum correlation is significant. More than 440 community colleges nationwide offer ISA programs, and many of them are in Fleet Concentration Areas.
- The Navy predicts that the shortage of Navy instructors to teach the new ISA course will remain or increase in the next 3 years. Few of the Navy ISA instructors have received formal ISA training. Most are self-taught, though virtually all have been through the Navy instructor school.
- It costs a minimum of $194,000 to equip a Navy computer lab for 15 students with Technical Training Equipment (TTE) [12]. Annual estimated maintenance costs per lab are about $20,000 [13].

Community college and Navy ISA curriculum

During visits in May and June 1997 to Tidewater Community College in Portsmouth, VA, Thomas Nelson Community College in Hampton,

VA, Anne Arrundel Community College in Severna Park, MD, and Northern Virginia Community College in Alexandria, VA, and to Connecticut Community Technical Colleges in July 1997, we identified substantial civilian curriculum correlation (60 percent or more overlap) between community college and Navy ISA courses. We compared community college information systems technology courses that are credited toward an Associate degree in Applied Science with the Navy's new NEC 2735 ISA curriculum. Both Navy and community college faculty found program compatibility and curriculum overlap, which could readily expand to include the majority of NEC 2735 ISA curriculum areas.

The only ISA course areas that presented any difficulty were related to training on older, Navy-specific computer equipment. These so-called legacy systems are not widely used by either other DOD branches or civilian industry. In many cases, the equipment manufacturer no longer provides equipment maintenance or technical support.

Navy ISA requirements

The Navy has a fast growing demand for qualified persons to fill ISA billets. The Navy expects to shift predominately to standardized, off-the-shelf hardware and software technology. Soon all workstations afloat and ashore will have a PC for the use of each worker; and all will connect to a Navy and DOD network. This need for interface and connectivity is not peculiar to the Navy, as these same technological skills are widely used in the civilian sector.

ISA NEC 2735 Technical Project Plans (TPP) are fluid. Since CNA discussions with Navy ISA course management personnel in April 1997, course information and requirements have changed dramatically and will probably continue to do so. For example, initial estimates of the billet requirements for NEC 2735 were about 1,300 and have now grown to almost 3,000, and the billet review is under way [13].

The Navy is also having difficulty keeping abreast of advances in information systems technology and meeting equipment and personnel training requisites. The Navy sources we contacted generally agreed that it will be difficult, if not impossible, to meet current and future

ISA NEC 2735 demand with current (planned) Navy schoolhouse resources.

ISA course

The three course locations, all of which opened in FY 1997, are Pensacola, FL, San Diego, CA, and Dam Neck, VA. Fifteen students are scheduled per class (ten Navy, two Army, two Air Force, one civilian) [13]. Five instructors per course are assigned (Pensacola has 1 extra billet for the course coordinator) [13].

Student throughput

Starting in FY 1999, each site will teach 11 or 12 eight-week classes per year, each site graduating 165 to 180 students annually. Total planned annual student throughput is 495 to 540, of which 330 to 360 will be Navy [13]. These numbers are based on zero attrition.

ISA instructors

When the courses were first stood up at each ISA site, only one of the Navy instructors already held NEC 2735. The NEC had been inactive, however, so there was no way that new instructors could have the NEC before teaching. All are now attending the course themselves (and earning the NEC) before teaching. Only one Navy instructor holds a civilian certification [13], whereas all Tidewater Community College instructors are either Novell or Windows NT certified [8].

The Navy expects it to take at least 3 years before all Navy instructor billets are filled by persons who hold NEC 2735 [13].

Proposal

To test whether this course lends itself to outsourcing, the second proposal experiments with outsourcing part of the ISA course in the Norfolk area to Tidewater Community College, moving the instructors at Dam Neck to TCC. We recommend TCC specifically because (a) this would be an experiment only, to determine feasibility of expansion, and (b) of the sites visited, TCC has the greatest existing overlap with the lowest cost.

Because this will be an experiment, competitive bids should not be necessary. No additional equipment is necessary and none needs to be moved. The experiment should last at least 6 months, and preferably 1 year, to accommodate 12 or more classes. If TCC instructors are used for the 60 percent of subject overlap and Navy instructors are used for the remaining subject matter, student throughput should be able to increase considerably at this site.

If the experiment is successful, the program can be competed and expanded. However, because of the rapidly changing technology and the cost of updating systems, community colleges may not be unique in their ability to provide training on state-of-the-art equipment at a reduced cost. A competitive bidding process would identify other candidates.

Advanced Electronics/Computing Field (AECF) technical core fundamentals

Background

The AECF recruiting program is relatively new and comprises three ratings: Electronics Technician (ET), Fire Controlman (FC), and Data Systems Technician (DS). Before FY 1996, the Navy assigned sailors to one of these ratings when they were given a school guarantee (either at enlistment or as a fleet returnee). Beginning in FY 1996, recruits were accessed into the AECF program, without specification of which rating, as part of the Advanced Electronics Field program of entry.[9] Only during the advanced electronics technical core fundamentals that all three ratings share is a sailor told to which of the three ratings he or she will ultimately report. After the common core, sailors continue with their assigned rating A-school curriculum and, in many cases, follow-on C-school training.

Starting in September 1997, phase-out of the DS rating will begin; no new recruits will be accepted. At that time, 48 percent of all AECF

9. Other ratings in this program are as follows: CTM, EW, FT, MT, OTM, STG, STS, and SWSE.

technical core graduates will receive assignments to the FC rating, and the remaining 52 percent to the ET rating. The FC and ET strands are each less than 15 weeks.

All of the strand training for both FCs and ETs is done at Great Lakes, but the C-school training is in multiple locations. For ETs, most of the C-schools are also in the Great Lakes area, but most of the C-schools for FCs are at the Fleet Combat Training Center in Dam Neck, VA (FCTCLANT).

Costs

The course for the AECF technical core is 19 weeks long, and NETPDTC estimates the cost, net of pay and allowances, to be about $15,000 per graduate.[10] It has a yearly throughput of about 2,500 sailors.[11] The actual requirements are larger,[12] but it is difficult to recruit enough people because of the high ASVAB requirements. Seasonal variations in accessions cause a large backlog for the course. In FY 1996, 118 man-years were spent Awaiting Instruction (AI) due to backlogs.[13] If we use a $25,000 yearly cost per person, that equates to a total cost of nearly $3 million per year because of backlogs alone. The backlogs also contribute to the berthing deficits that arise during the year at Great Lakes.

Outsourcing potential

In addition to the problems in managing the pipeline within the Navy, the basic electronics curriculum has good civilian alternatives. There is very little Navy-specific equipment required for this training, and good Industry Skills Standards exist in electronics. As a result, the technical core fundamentals overlap significantly with community college curriculum in electronics technology. Also, electronics

10. NETPDTC costs do not include all claimant costs, such as the cost to train instructors.

11. Data are from NITRAS Student Master File.

12. In FY 96, recruiters achieved only 75.9 percent of the AECF goal of 3,140. (CNRC September 1996 Monthly Recruiting Brief to CNP)

13. The days awaiting instruction due to backlog are from the NITRAS Training Summary File.

technology is widely available in community colleges. *Peterson's Guide* lists 565 community colleges offering basic electronics [14].

Because of the significant civilian overlap and abundance of community colleges offering this curriculum, this may be a fairly straightforward training curriculum to outsource. At the same time, it is difficult because of the issues involved in outsourcing A-school instruction (i.e., the potential loss of unique militarization that occurs in Navy A-school classes, with Navy instructors, on Navy facilities). The Navy does have experience with outsourcing this particular A-school training to community colleges, but in the more traditional way. In the past, Great Lakes Service School Command has contracted with the College of Lake County to provide instructors, curriculum development, and administrative support, while being taught at the Service School Command [3]. The College of Lake County lost the contract in a competitive bid, and faculty from the San Diego Community College District are now conducting the training.

Community college overlap

Just how much overlap is there between Navy and community college curriculum in electronics? Without looking at all 565 colleges, it is difficult to say. But we looked at the curriculum at Northern Virginia Community College with BuPers personnel in the fall of 1996, and CNET personnel recently looked at the curriculum of several community colleges in the State of Washington. Overall, there appears to be significant overlap in most of these programs.

For the purposes of this project, we met with faculty in the Electronics Technology program at Thomas Nelson Community College and the Engineering/Industrial Technology Program from Tidewater Community College, Virginia Beach campus. Together with the CNET Electronics Program Manager and Electronics Common Core Training Program Coordinator (TPC), we compared the curriculum for the AECF technical core to the 2-year curriculum for an Associate in Applied Science degree. The most overlap appears to be with the Tidewater Community College curriculum, so that is the one that we will discuss here.

Appendix A contains the requirements for this degree and a comparison of the overlap. Of the 20-week[14] Navy curriculum, TCC currently covers about 19 weeks (plus it provides much more training in the 2-year program). The 1-week curriculum that is missing includes AM/FM modulators, RF Amps, and fiber optics.

Options for outsourcing AECF training

We offer two different methods for outsourcing this training that have potential for saving money. The first is to contract with community colleges to offer the Navy training on their facilities, using both Navy and college instructors. The second method is to recruit community college graduates who have degrees in electronics technology, and have them skip the technical core fundamentals entirely if they are deemed competent in the material. We discuss both of these methods in more detail in the following subsection.

Outsource AECF technical core training to community colleges in Fleet Concentration Areas

Because of the backlogs cited in AECF training and the overlap with the community college curriculum, outsourcing the training to community colleges in Fleet Concentration Areas (FCAs) has the potential for significant savings. Outsourcing would mean transferring training from Navy facilities to civilian facilities, in one or more.

Why in FCAs?

If training is located near the fleet, some part of the training could include hands-on experience with the fleet. In other words, sailors could see how the systems actually work on different platforms. This is currently not possible in Great Lakes. Also, for those who are sent for training in AECF technical core fundamentals from the fleet, the PCS costs will be eliminated if the training is in the same geographic area. Retaining some or all of the instructor billets for the curriculum increases the number of desirable shore billets in FCAs, which benefits the homebasing initiatives.

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14. At the time, the curriculum was 20 weeks.

Loss of militarization

Probably the biggest problem with outsourcing A-school training is the loss of militarization. For students entering the AECF core curriculum, boot camp has been their only exposure to the Navy. Military instructors during A-school are able to reinforce some of the lessons of boot camp.

Some outsourcing of A-schools has already taken place, but it has been of the more traditional type, meaning the instruction still takes place on Navy facilities. We cannot say how much loss of militarization would result from sailors receiving instruction on civilian facilities.

But we need to compare the cost of reduced militarization with the benefits of outsourcing the training, including both pecuniary and non-pecuniary. For instance:

- What are the benefits of having this training conducted near the fleet so that sailors will have actual fleet experience upon graduation?
- What is the benefit to recruiting of an increased Navy presence on the campus?
- How would increasing the opportunities for sailors to earn credits toward Associate degrees benefit recruiting or retention?[15]
- What is the true cost of the current training?
- How valuable is it to increase instructor billets in FCAs?
- What are the benefits of relieving some of the burden on berthing in Great Lakes?
- What is the total cost of the awaiting instruction backlog?

15. According to the SOCNAV 1996 guide, the numbers of undergraduate hours recommended for a Third Class Petty Officer in the ET and FC ratings are 14 and 6, respectively [9]. TCC would award 33 credits for the same training.

At present, CNET believes that the cost of the loss of militarization in outsourcing A-school courses outweighs the benefit. Nonetheless, we had developed a proposal for an experiment before learning about this assessment. We offer the proposal for informational purposes.

Proposal

We propose that CNET experiment with outsourcing a sample of the technical core fundamentals for a short period of time. If 100 sailors were chosen, with a class size of 20, and a new convening every week, the experiment would span 24 weeks. This would give enough time to apply lessons learned in the first few convenings to later convenings.

Consider the following factors in designing this experiment. First, establish a control group for comparison, with the same characteristics (e.g., ASVAB, gender, race, education, age, and marital status) as the experimental group. The best way to do this is to choose the groups at random. Second, use the same course material and exams. However, the college should still be allowed flexibility in how it teaches that curriculum (homework assigned, extra readings, and so on).

Administrators at TCC would not object to having sailors attend in uniform, or to having Navy instructors share the podium (they would need to add faculty to teach the increased load, so this saves them as well). We are uncertain about the view of the other schools on this issue.

Tidewater Community College estimates that the 20 weeks of training constitute about 33 semester hours (of the 68 required for the A.A.S. degree). Their charges are $53 per credit hour, for a total charge of $1,749 per sailor for the 20-week course.

The tuition would not represent the total cost to the Navy for this training. Sailors would require housing on base and transportation to and from the campus. In addition, the Navy would have to include an allowance for lunch (estimated to be $3/day) and the cost of any military personnel involved in the experiment, such as instructors and military advisors.

Finally, the experiment would involve additional PCS costs. The amount would depend on the type of experiment chosen.

The AECF technical core feeds into two different ratings (as of September 1997), which leads to two different options for an experiment. The first option is to experiment only with those who will ultimately become FCs. The second option is to take a more random sample and experiment with sailors who will become either FCs or ETs. These options are outlined in detail below.

Option 1: Nonrandom selection of FCs

What are the benefits of choosing only FCs for an experiment?

- The 11-week A-school strand is mostly classroom instruction with little or no equipment requirements.[16]
- Between 90 and 95 percent of the C-school training for FCs is in the Norfolk area.[17]
- Building on the first two bullets, if sailors could also take the FC A-school strand in the Norfolk area, most sailors would not have to make additional moves.

It seems feasible to conduct this experiment in the Norfolk area. The C-school courses are taught at FCTCLANT in Dam Neck, and this facility has plenty of available classroom space. And, according to both Naval Facilities Engineering Command (NAVFAC), Housing Directorate for Bachelor Housing, and NAVPHIBASE Little Creek, there is available berthing nearby at the Little Creek NAVPHIBASE (see appendix B for berthing availability in the Norfolk area).

What are the complications of choosing only those who will ultimately become FCs?

- It requires a "new"[18] process of rating assignment. In other words, instead of choosing whether a sailor will be an FC or ET

16. Personal conversation with CNET T23 personnel, June 1997.
17. As stated earlier, the numbers of undergraduate hours recommended for a Third Class Petty Officer in the ET and FC ratings are 14 and 6, respectively [9]. TCC would award 33 credits for the same training.
18. This, in fact, is not a new process. Until less than 2 years ago, this is how FCs and ETs were recruited.

during the technical core fundamentals, the decision would take place at boot camp, or possibly at the time of enlistment. For the purposes of an experiment, this would not require significant changes. The 100 sailors could come from volunteers or from a randomly chosen sample. However, to be able to statistically compare the 100 sailors for the experiment with a control group, the sailors need to be randomly chosen.

- Choosing only FCs would limit the experiment to providing input on whether outsourcing works for the FC rating. If the goal is to ultimately outsource all AECF technical core fundamentals, this may not be adequate.

This option has an additional cost. For those sailors who would ultimately go to an FC C-school that is not in the Norfolk area, they will incur an additional move. Under the current way of doing business, FCs remain at Great Lakes from boot camp through AECF core and strand. The vast majority then move to another geographic location for their C-school. Most of these go to Dam Neck, but for those who would stay in Great Lakes for C-school or attend C-school in a location other than Dam Neck, they will incur an additional move.

The average PCS cost to move an E-2, E-3, or E-4 with one dependent from Great Lakes to Norfolk is $2,317. With no dependents and no furniture, the cost is about $350.[19] If 90 percent of sailors in this experiment were single, the average PCS cost would be $500.

As stated earlier, between 90 and 95 percent of FCs attend C-school at Dam Neck. Using the 90-percent figure, only 10 percent would be incurring an additional move. This means that the average additional cost per sailor, for all 100 sailors, would be $50.

Option 2: Randomly choose sailors, regardless of ultimate rating assignment

Option 2, in contrast to the first option, would not involve choosing sailors in advance to become FCs. Option 2 addresses two concerns with the first option:

19. Cost estimates are from Pers-4.

- It provides an unbiased sample to determine whether outsourcing training works for ETs as well as FCs.
- It requires no change in the current rating assignment process.

This option, however, is more costly than the first. Why? Because the ET A-school strand and C-schools rely heavily on large Navy-specific equipment, it is not feasible to experiment with moving those components of the training to the Norfolk area. As a result, those in the experiment who will ultimately become ETs will have additional moving expenses. About 50 percent will be chosen to attend ET A-school strand after the technical core. These sailors will incur two additional moves (one to Norfolk and another back to Great Lakes). Using the same average PCS costs cited in the first option, we estimate that the additional PCS costs would be approximately $525 per sailor.[20]

Recruit community college graduates with degrees in electronics technology

The other method for reducing the cost of training is to recruit pretrained people who qualify for skipping all or most of a segment of training. Results of two CNA studies [4, 5] show that such recruits experience much lower attrition (Delayed Entry Program, boot camp, A-school, and fleet) than the overall Navy. In addition, these pretrained people have performed very well in their A-school courses.[21]

The electronics field has an extensive network of community colleges: 565 community colleges teach electronics technology and 312 teach electronics engineering technology [14]. The Bureau of Labor

20. Fifty percent will cost an additional $1,000 in PCS, and 5 percent will cost an additional $500. (The latter are the FCs who would not attend C-school in Norfolk. In this option, FCs are only 50 percent, so 10 percent of 50 percent is 5 percent.)

21. These pretrained recruits are graduates of an allied health field who enlist as HM or DT school guarantees. Their civilian training provides the opportunity to award the appropriate NEC after successful completion of A-school.

Statistics predicts that job growth for electronic equipment repairers will decline through the year 2005, and that the job growth for engineering technicians will grow more slowly than average through the year 2005 [12]. In 1993, beginning maintenance electronics technicians had median earnings of $10.75 per hour (about $22,000 per year). The median salary for the most junior engineering technicians was $16,590 [15].

Thus, the flow of graduates appears to be adequate and the job market for recent graduates relatively tight. Under existing programs, recruits with 45 semester hours of credit (A.A.S. degrees are at least that many credits) are eligible for enlistment at the E-3 level. In FY 1997, the Regular Military Compensation (RMC) for an E-3 with less than 2 years of experience was $20,681.[22] Thus, the starting salary in the Navy is a bit lower than that for civilians. The AECF program also offers a generous enlistment bonus during off-peak recruiting months (usually October through May), which in FY 1997 had been as high as $8,000, but whether this is enough to attract enough qualified people remains uncertain. Other incentives might include accession at E-4 vice E-3. The RMC for an E-4 with less than 2 years of experience in FY 1997 is $22,159.

The two major concerns in recruiting pretrained are less military experience upon entering the fleet and lack of a standardized test of competency. As stated earlier, from looking at electronics-related curricula at Northern Virginia Community College, Tidewater Community College, Thomas Nelson Community College, and several community colleges in the State of Washington, we believe that many programs have significant overlap.

It would be a daunting task, however, to evaluate the curricula of all 877 electronics-related programs in community colleges across the country. Another option for assessing competencies is to develop "challenge exams" to evaluate whether a recruit has enough training

22. RMC combines basic pay, Basic Allowance for Quarters, Basic Allowance for Subsistence, average Variable Housing Allowance, and the tax advantage from untaxed allowances.

to eliminate some or all of the technical core fundamentals. The final exam given for the core course is one possibility.

A second option for assessing competencies is to recruit only from institutions that follow a certain standard for the curriculum and eliminate the need for challenge exams. Such standards exist for electronics. In 1994, a joint project of the Electronic Industries Association and the Electronic Industries Foundation developed skill standards to "measure and promote the competency of work-ready, entry-level U.S. electronics technicians" [12]. CNET personnel would need to examine the skill standards to see if they meet the needs of the technical core fundamentals. The next step would be to identify colleges that follow these standards and target them for recruiting.

CNA is also investigating the feasibility of the Navy developing Tech Prep partnerships with community colleges to create tailor-made courses of instruction [16]. Tech Prep is related to the Federal Government's School-to-Work Opportunities Act. The U.S. Department of Education defines Tech Prep education as "a four-year planned sequence of study for a technical field, beginning in the eleventh year of high school" [17]. Such partnerships benefit recruiting by allowing recruiters to make contact with students in the junior year of high school and follow them through to earning Associate degrees. Partnerships also open the door for recruiters to make presentations to targeted classes, to be present at job fairs for particular majors, and possibly to offer Navy "field trips" as part of a classroom experience (particularly in Fleet Concentration Areas).

Contracting issues

Although the Navy has experience contracting with civilian training institutions, it has very little experience with the type of outsourcing that we have suggested in this paper, that is, on civilian facilities with civilian and/or Navy instructors. Certainly, some of the same concerns of contracting with civilians on Navy facilities would apply to contracting on civilian facilities. These include:

- Will contracting maintain, or even enhance, fleet readiness?
- How much money can these types of contracts save?
- How much control can the Navy maintain over the curriculum?
- How much flexibility can be built into the contract regarding the timing and size of classes?
- Can civilian instructors incorporate Navy-specific equipment and curriculum?
- How can the civilian instructors be made accountable for their performance?

Outsourcing on civilian facilities, however, adds some extra risks. For instance, if the community college is given some Navy-specific equipment, it may create a large advantage in future competitions. Other competitors will have to account for the cost of moving equipment, while the incumbent provider will not. In cases with large pieces of equipment, this may become a substantial advantage that could lead to cost creep in follow-on contracts.

Another concern is that, once a contract is awarded, costs may increase dramatically. In the current discussions with Tidewater Community College and Thomas Nelson Community College, administrators have said that Navy students would be charged the same price as all other students (i.e., $50 per credit hour).[23] And, by tying the cost to the Navy

23. The cost is low because the State of Virginia heavily subsidizes these schools to make public postsecondary schools more affordable.

to the cost of the general population, the probability of substantial tuition increases on subsequent contracts is sharply reduced.

Another contracting issue is whether the charge should be by the class convening or by the credit hour. Each has its advantages and its risks. A per-convening contract could be risky for the Navy in the case of further downsizing because, as class size shrinks, the cost per student would go up. But, a per-credit-hour contract would be riskier for the community college, if the Navy's demand is uncertain. In this case, the college might build that risk into the price and charge a higher price credit hour to absorb the risk of the uncertain demand. Thus, the Navy will have to weigh the risk versus the rewards of the alternatives as it chooses between the types of contract provisions.

Articulation agreements/contracts

Studying the use of skill standards and contract training in the private sector can reveal what conditions make it easier or more difficult to write contracts that ensure quality. Purchasing training always involves costs in writing and monitoring contracts. One must investigate what insights private firms can provide regarding these costs. This includes determining how generic the training can be because more generic training has wider markets in the civilian community. Can contracts/articulation agreements be rigorous enough to ensure that the community colleges will train in a way that is conducive to the Navy and its culture?

Who will have responsibility?

In civilian institutions, a majority of students studying to become electronics technicians do not successfully complete their training. In part, they have difficulty understanding basic math and science. They do not have the knowledge required, at the outset, to complete training successfully. Civilian students should, but do not always, receive adequate counseling and preparation before entering certain technical programs, notably Electronics. An important part of any articulation agreement's development will be to determine who is responsible for keeping attrition down but the learning and graduation levels up. Could this be accomplished through team teaching with a combination of military and civilian instructors?

Conclusions

In this research memorandum, we have articulated the arguments for using the nation's community colleges as a resource for Navy training. Many parts of a community college education are similar or even identical to the education the Navy provides sailors. Using community colleges would allow the Navy to divest itself of some of its costly infrastructure. While this is always a good idea, it is particularly important in this time of tight and possibly declining funding.

We have offered two different models for using community colleges. First, we have articulated elsewhere the case for recruiting pretrained individuals, that is, community college graduates in majors that relate to Navy service. Second, the Navy could contract directly with community colleges to allow Navy students in their courses. These courses could either be part of a standard curriculum or specially tailored for the Navy. In this case, we have proposed three different possible experiments:

- Air Conditioning and Refrigeration C-school
- Information Systems Administrator C-school
- Advanced Electronics/Computing Field Technical Fundamentals Core (A-school).

When we presented these proposals to Vice Admiral Tracey (N-7/CNET) on 9 July 1997, she agreed to experiment with the C-school outsourcing but felt that outsourcing A-school would contradict other initiatives under way to improve the integration of new sailors into the Navy. She directed her staff to continue to investigate issues that involve contracting out the C-schools. These efforts continue.

Appendix A: Electronics engineering technology curriculum requirements

Table 1 is a list of the course requirements for an A.A.S. degree at Tidewater Community College (TCC).

Table 1. Course requirements for A.A.S. degree at TCC

Course title[a]	Credits
College Composition I	3
D.C. and A.C. Fundamentals I*	4
Health, Physical Education or Recreation	1
Principles of Public Speaking	3
Precalculus I*	3
Preparation for Employment	1
College Composition II	3
D.C. and A.C. Fundamentals II*	4
Amplifiers and Integrated Circuits*	4
Precalculus II*	3
Calculus with Analytic Geometry	5
Intermediate Electronics*	4
Digital Principles, Terminology, and Applications*	4
Microprocessor Applications I	4
General Elective	3
General College Physics 1	4
Social Science Elective	3
Health, Physical Education or Recreation	1
Social Science Elective	3
Cooperative Education or ETR elective	4
General College Physics II	4
Other courses added for Navy curriculum:	
Applied Technical Math*	3
Computer Troubleshooting and Repair*	4

a. Courses marked with an asterisk indicate overlap with the Navy curriculum.

Appendix B: Berthing availability in the Norfolk area

Tables 2 and 3 give information on berthing availability in Norfolk by assignment and paygrade and by time of year.

Table 2. Berthing availability in the Norfolk area by length of assignment and paygrade[a]

Activity	Permanent party excess[b]		Transient party excess[c]	
	E1-4	E5-6	E1-4	E5-6
Chesapeake NAVSECGRP at NW	0	22	32	0
Dam Neck NFCTC, VA Beach	66	0	70	2
Norfolk NAVSPYD, Portsmouth	0	0	124	218
Norfolk LANTFLT-HQSUPACT	109	0	NA	NA
Norfolk NAVAIRSTN	98	1	113	3
Norfolk NAVAMPHIBS LIL CREEK	427	0	16	17
Norfolk NAVSTN	472	0	98	69
Oceana NAVAIRSTN, VA Beach	25	3	NA	NA
Portsmouth NAVMEDCTR	212	0	NA	NA
Yorktown NAVWPNSTN	12	0	NA	NA

a. Data are from Naval Facilities Engineering Command (NAVFAC), Housing Directorate for Bachelor Housing.
b. We define permanent party as those with assignments of 20 weeks or longer. Excess is defined as capacity less utilization.
c. We define transient party as those with assignments of less than 20 weeks.

Table 3. Berthing availability in Norfolk area by time of year[a]

Location	Peak periods	Overall utilization (percentage)	Low periods	Overall utilization (percentage)
NAVPHIBASE, Little Creek	Feb-Sep	81	Sep-Jan	42
Oceana	Mar-Oct	89	Nov-Jan	41
Dam Neck	All year	100	Nov Dec	80
Portsmouth	Feb-Sep	95	Oct-Jan	73
NAS Norfolk	May-Aug	92	Nov-Jan	41
Norfolk Naval Base	Apr-Nov	86	Nov-Jan	55

a. Data are from NAVPHIBASE Little Creek.

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